

CLAIMS

What is claimed is:

- 5     1.     A method, comprising:  
          compressing firmware variable data via firmware to produce compressed firmware  
          variable data; and  
          storing the compressed firmware variable data in a firmware storage device.
- 10    2.     The method of claim 1, further comprising:  
          retrieving the compressed firmware variable data from the firmware storage  
          device; and  
          decompressing the compressed firmware variable data.
- 15    3.     The method of claim 1, wherein the compressed firmware variable data comprise  
          original firmware variable data, further comprising updating the original firmware variable  
          data with new firmware variable data by performing operations including:  
          storing the new firmware variable data in the firmware storage device in one of a  
          compressed or uncompressed form; and  
20        marking the original firmware variable data as deleted.
4.     The method of claim 3, wherein the original and new firmware variable data are  
          stored in a memory block of the firmware storage device, further comprising coalescing  
          the variable data in the firmware block by performing operating including:  
25        storing an image of the memory block;  
          erasing the memory block; and

compressing any variables not marked as deleted in the image of the memory block and writing them back to the memory block while skipping any variables marked as deleted.

- 5 5. The method of claim 1, further comprising storing indicia with the compressed  
firmware variable data to indicate that the data are compressed.
6. The method of claim 1, wherein the compressed firmware variable data are stored  
in a 2-tuple format of
- 10 
$$\langle M'_i, C(B_i) \rangle,$$
- wherein  $M'_i$  comprises metadata corresponding to an  $i$ th tuple,  $B_i$  comprises data  
corresponding to the  $i$ th tuple, and  $C$  represents a compression function.
7. The method of claim 1, further comprising providing an interface to enable an  
15 operating system runtime component to access compressed firmware variable data.
8. The method of claim 1, further comprising encrypting the firmware variable data  
before or after it is compressed to convert the firmware variable data into a compressed  
and encrypted form.
- 20 9. A method, comprising:
- receiving a request to store a first firmware variable;
- determining if a compressor is available for compressing the first firmware  
variable; and
- 25 employing the compressor if it is available to compress the first firmware variable  
and store it in a firmware storage device, otherwise storing the first firmware variable in  
an uncompressed form in the firmware storage device if the compressor is not available.

10. The method of claim 9, further comprising:

receiving a request to store a second firmware variable;

determining the compressor is no longer available; and

5 storing the second firmware variable in the firmware storage device in an uncompressed form.

11. The method of claim 9, wherein uncompressed firmware variables are stored in a 2-tuple format of

10  $\langle M_i, B_i \rangle$ ,

wherein  $M_i$  comprises metadata corresponding to an  $i$ th tuple, and  $B_i$  comprises data corresponding to the  $i$ th tuple, while compressed firmware variables are stored in a 2-tuple format of

$\langle M'_i, C(B_i) \rangle$ ,

15 wherein  $M'_i$  comprises metadata corresponding to an  $i$ th tuple containing indicia indicating the  $i$ th tuple is compressed,  $B_i$  comprises data corresponding to the  $i$ th tuple, and  $C$  represents a compression function.

12. A method, comprising:

20 in response to a computer system power-on or reset event,

scanning a firmware storage device in the computer system for uncompressed firmware variables that are stored in an uncompressed form;

converting the uncompressed firmware variables to a compressed form.

25 13. The method of claim 12, wherein the uncompressed firmware variables are converted to a compressed form by performing operations including:

copying an image of a firmware memory block in which the uncompressed  
firmware variables are stored;

erasing the firmware memory block;

compressing each uncompressed variable; and

5 writing the compressed variables back to the firmware memory block.

14. The method of claim 13, further comprising:

scanning the image for any compressed firmware variables; and

writing the compressed variables back to the firmware memory block.

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15. A method comprising:

storing a first converter in a non-fault tolerant portion of a firmware storage device;

storing a first deconverter in a fault tolerant portion of the firmware storage device;

determining if the first converter is available; and

15 storing firmware variables in a first converted form if the first converter is  
determined to be available, otherwise storing the firmware variables in a unconverted  
form.

16. The method of claim 15, further comprising accessing firmware variables stored in  
20 the first converted form with the first decompressor.

17. The method of claim 15, further comprising:

storing a second converter in a non-fault tolerant portion of the firmware storage  
device;

25 storing a second deconverter in a fault tolerant portion of the firmware storage  
device;

determining if the second converter is available; and

storing firmware variables in a combined converted form via first and second conversion operations performed by the first and second converters if it is determined that both of the first and second converters are available, or storing firmware variables in the first converted form via conversion operations performed by the first converter if it is  
5 determined that the first converter is available while the second converter is not available, otherwise storing firmware variables in a second converted form via conversion operations performed by the second converter if it is determined that the second converter is available while the first converter is not available.

- 10 18. An article of manufacture, comprising:  
a machine-readable medium on which instructions are stored, which when executed facilitate storage of firmware variable data by performing operations including:  
receiving a request to store firmware variable data;  
compressing the firmware variable data to produce compressed firmware  
15 variable data; and  
storing the compressed firmware variable data in a firmware storage device.

19. The article of manufacture of claim 18, wherein execution of the instructions further performs the operations of:  
20 retrieving the compressed firmware variable data from the firmware storage device; and  
decompressing the compressed firmware variable data. ..

20. The article of manufacture of claim 19, wherein the instructions comprise  
25 firmware.

21. The article of manufacture of claim 20, wherein the article comprises flash memory.

22. An article of manufacture, comprising:

5 a machine-readable medium on which instructions are stored, which when executed facilitate storage of firmware variables by performing operations including:

receiving a request to store a first firmware variable;

determining if a compressor is available for compressing the first firmware variable; and

10 employing the compressor if it is available to compress the first firmware variable and store it in a firmware storage device, otherwise storing the first firmware variable in an uncompressed form in the firmware storage device if the compressor is not available.

15 23. The article of manufacture of claim 22, wherein the article comprises flash memory.

24. The article of manufacture of claim 23, wherein a portion of the instructions comprise a compressor employed for compressing firmware variables and the flash  
20 memory includes a non-fault tolerant block of memory in which the compressor is stored.

25. The article of manufacture of claim 24, wherein execution of the instructions performs the further operations of:

receiving a request to store a second firmware variable;

25 determining the compressor is no longer available; and

storing the second firmware variable in the firmware storage device in an uncompressed form.

26. The article of manufacture of claim 23, wherein a portion of the instructions comprise a decompressor employed for decompressing compressed firmware variables and the flash memory includes a fault-tolerant block of memory in which the  
5 decompressor is stored.

27. A computer system, comprising:

a motherboard;

a processor, coupled to the motherboard;

10 volatile memory, coupled to the motherboard; and

a boot firmware device, coupled to the motherboard and comprising flash memory having firmware components stored therein including a compressor, the firmware components comprising instructions that when executed by the processor effectuate storage of firmware variables by performing operations including:

15 publishing an interface;

receiving a request to store a firmware variable via the interface;

determining if the compressor is available for compressing the firmware variable; and

20 employing the compressor if it is available to compress the first firmware variable and store it in the boot firmware device, otherwise storing the firmware variable in an uncompressed form in the boot firmware device if the compressor is not available..

28. The computer system of claim 27, wherein a portion of the instructions comprise a  
25 decompressor employed for decompressing compressed firmware variables.

29. - The computer system of claim 28, wherein the compressor is stored in a non-fault tolerant block of the boot firmware device and the decompressor is stored in a non-updateable block of the boot firmware device.

5 30. The computer system of claim 27, wherein execution of the instructions further performs the operations of:

receiving a request from a requester to read a firmware variable stored in the boot firmware device;

10 determining if the firmware variable is stored in a compressed or uncompressed form; and

decompressing the firmware variable to produce an uncompressed firmware variable and providing the uncompressed firmware variable to the requester if the firmware variable is stored in a compressed form, otherwise providing the firmware variable to the requester if the firmware variable is stored in an uncompressed form.